ABSTRACT

The intricate interplay between warming climate and the consequent changes in biogeochemistry still needs to be explored in the regional level. Analysis of NPP and its stressors in the past implies dominant contributions from Sea Surface Temperature (SST) and Ocean Heat Content. An estimate of the monthly Net Primary Productivity (NPP) in the euphotic zone of NIO using bio-argo measurements is done and then compared to available satellite-based NPP algorithms. NPP estimates using bio-argo imply that the Vertically Generalised Production Model (VGPM) perform better in NIO with high correlation and accuracy. In Arabian Sea (AS), the highest Chl-a, NPP and AOD are observed in June, July, August and September (JJAS). Similarly, the highest Chl-a and NPP are found in JJAS, but AOD in March, April, and May (MAM) in Bay of Bengal (BoB). We identify Mixed Layer Depth (MLD), O_2 in 0–200 m and Oxygen Minimum Zone (OMZ) as the main factors controlling NPP in the present period. The assessment shows the reduction in AOD, decreased wind speeds, increased SST and reduced NPP during the lockdown period, suggesting the impact of changes in atmospheric input on the ocean biogeochemistry. A coupled model is customised for NIO and the validation of model results with measurements shows that SST and sea surface salinity (SSS) are better simulated by the coupled model with an average bias of ±0.2 °C and 0.2–0.5 psu, respectively. In NIO, uptake by phytoplankton is the dominant biological process, except in the northern AS, where denitrification is dominant. New production contributes to NPP in most upwelling regions in AS, except in the northern AS and dome of Sri Lanka, where regenerated production is higher than new production. The future projections of NPP using Coupled Model Intercomparison Project Phase 6 (CMIP6) under different Shared Socioeconomic Pathways (SSP) scenarios exhibit decline in NPP near Somali Coast. The future analysis also shows that SSS and O_2 in 0–200 m and OMZ are the key factors that contribute to NPP change in the future scenarios.

Keywords: *NIO, AS, BoB, NPP, Stressors, Coupled model*